

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-4. (Canceled)

1 5. (Currently amended): A method for writing data to a cache memory
2 wherein a data write-in request is issued from an information processor to a storage control
3 apparatus, the storage control apparatus including a plurality of channel control units each having
4 an interface with the information processor; a disk control unit having an interface with a storage
5 device for storing data; a local cache memory disposed in each channel control unit for
6 temporarily storing data to be interchanged between the information processor and the storage
7 device; a dedicated data transfer path between at least two of the local cache memories; [[and]] a
8 connector unit to provide data paths among the plurality of channel control units and the disk
9 control unit separate from the dedicated data transfer path; and a global cache memory connected
10 to the connector unit, the method comprising:
11 receiving data to be written from the information processor;
12 writing the data to be written to the local cache memory of a first channel control
13 unit, wherein if the local cache memory does not have sufficient capacity to store the data to be
14 written then first transmitting an amount of data stored in the local cache memory to the global
15 cache memory by way of the connector unit in order to obtain sufficient capacity in the local
16 cache memory to store the data to be written;
17 transmitting the data to be written through the dedicated data transfer path to a
18 second channel control unit connected to the first channel control unit;
19 writing the transmitted data to the local memory of the second channel control
20 unit;

21 receiving through the dedicated data transfer path an acknowledgement indicating
22 that writing of the transmitted data to the local cache memory disposed in the second channel
23 control unit has completed; and

24 transmitting the acknowledgement to the information processor to notify the
25 information processor that data written to the local cache memory of the second channel control
26 unit has completed.

1 6. (Currently amended): A method in a storage control apparatus for reading
2 in data stored in a second cache memory to a first cache memory, the storage control apparatus
3 including a plurality of channel control units each having an interface with an information
4 processor; a disk control unit having an interface with a storage device for storing data; a
5 plurality of first cache memories each being disposed in one of the channel control units for
6 temporarily storing data to be interchanged between the information processor and the storage
7 device, the first cache memory of at least two of the channel control units being connected to one
8 another through a dedicated data transfer path; and a connector unit to provide data paths among
9 the plurality of channel control units and the disk control unit separate from the dedicated data
10 transfer path, the connector unit connected to the second cache memory, the method comprising:

11 transmitting a read-out command of the data to the second cache memory;

12 acquiring the data from the second cache memory;

13 writing the acquired data to the first cache memory of a first channel control unit,

14 wherein if the first cache memory does not have sufficient capacity to store the acquired data
15 then first transmitting an amount of data stored in the first cache memory to the second cache
16 memory by way of the connector unit in order to obtain sufficient capacity in the first cache
17 memory to store the acquired data;

18 transmitting the acquired data through the dedicated data transfer path from the
19 first cache memory of the first channel control unit to the first cache memory of [[to]] a second
20 channel control unit connected to the first channel control unit; and

21 receiving an acknowledgement from the second channel control unit indicating
22 that the acquired data has been written to the first cache memory of the second channel control
23 unit.

1 7. (Currently amended): A method performed by a channel control unit for
2 reading out data wherein a data read-out request is issued from an information processor to a
3 storage control apparatus, the storage control apparatus including a plurality of channel control
4 units each having an interface with the information processor; a disk control unit having an
5 interface with a storage device for storing data; a first cache memory in each of the channel
6 control units for temporarily storing data, to be interchanged between the information processor
7 and the storage device, the first cache memory of at least two of the channel control units being
8 connected to one another through a dedicated data transfer path; a plurality of second cache
9 memories; and a connector unit to provide data paths among the plurality of channel control
10 units and the disk control unit separate from the dedicated data transfer path, the connector unit
11 connected to the second cache memories, the method comprising:

12 receiving from the information processor a read-out command for data for which
13 an address is specified;

14 determining whether the data at the specified address is stored in the first cache
15 memory of a first channel control unit;

16 transmitting a read-out command of the data to one of the second cache
17 memories if the data at the specified address is not stored in the first cache memory of the first
18 channel control unit;

19 acquiring the data from said one of the second cache memories ~~memory~~;

20 writing the acquired data to the first cache memory of the first channel control
21 unit, wherein if the first cache memory does not have sufficient capacity to store the acquired
22 data then first transmitting an amount of data stored in the first cache memory to said one of the
23 second cache memories by way of the connector unit in order to obtain sufficient capacity in the
24 first cache memory to store the acquired data;

transmitting the acquired data through the dedicated data transfer path to a second channel control unit connected to the first channel control unit;
receiving from the second channel control unit an acknowledgement indicating that writing of the acquired data to the first cache memory disposed in the other second control unit has completed; and
transmitting the acquired data to the information processor.

8-11. (Canceled)

12. (Currently amended): A channel control unit in a storage control apparatus including a plurality of channel control units ~~each having an interface with an information processor~~; a disk control unit having an interface with a storage device for storing data; ~~a first cache memory in each channel control unit for temporarily storing data to be interchanged between the information processor and the storage device, the first cache memory of at least two of the channel control units being connected to one another by a dedicated data transfer path used for storing mutually the temporarily stored data~~; a second cache memory; and a connector unit to provide data paths among the plurality of channel control units, the disk control unit and the second cache memories separate from the dedicated data transfer path, the connector unit connected to the second cache memory, [[the]]each channel control unit comprising:

a first cache memory for temporarily storing data to be interchanged between the information processor and the storage device, the first cache memory of at least two of the channel control units being connected to one another by the dedicated data transfer path for storing mutually the temporarily stored data;

~~a transmitter-first interface~~ for transmitting to the second cache memory a read-out command for data stored in the second cache memory;

an acquiring portion for acquiring the data from the second cache memory;

a writing portion for writing the acquired data to the first cache memory ~~of the channel control unit~~;

21 a ~~transmitter~~second interface for transmitting the acquired data through the
22 dedicated data transfer path to another channel control unit~~connected to the channel control unit~~;
23 and
24 a receiver for receiving from ~~the others~~said another channel control unit an
25 acknowledgement notifying that the writing of the transmitted data to the first cache memory
26 disposed in ~~the others~~said another channel control unit has completed,
27 the first interface further for transmitting an amount of data from the first cache
28 memory to the second cache memory via the connector unit when the first cache memory has
29 insufficient capacity to store data to be written, the amount of data that is transmitted being
30 sufficient to increase the capacity of the first cache memory.

1 13. (Currently amended): A channel control unit in a storage control
2 apparatus including a plurality of channel control units~~each having an interface with an~~
3 ~~information processor~~; a disk control unit having an interface with a storage device for storing
4 data; ~~a first cache memory in each channel control unit for temporarily storing data to be~~
5 ~~interchanged between the information processor and the storage device, the first cache memory~~
6 ~~of at least two of the channel control units being connected to one another through a dedicated~~
7 data transfer path; at least one second cache memory; and a connector unit to provide data paths
8 among the plurality of channel control units, the disk control unit and the at least one second
9 cache memory separate from the dedicated data transfer path, the connector unit connected to the
10 at least one second cache memory. [[the]]each channel control unit comprising:

11 an interface with an information processor;
12 a first cache memory for temporarily storing data to be interchanged between the
13 information processor and the storage device, the first cache memory of at least two of the
14 channel control units being connected to one another through the dedicated data transfer path;
15 a receiver for receiving from the information processor a read-out command for
16 data for which the address is specified;
17 a determining portion for determining whether the data at the specified address is
18 stored in the first cache memory~~of the channel control unit~~;

19 a transmitter for transmitting the read-out command for the data to the at least one
20 second cache memory if the data at the specified address is not stored in the first cache memory;
21 an acquiring portion for acquiring the data from the at least one second cache
22 memory;
23 a writing portion for writing the acquired data to the first cache memory ~~of the~~
24 ~~channel control unit, wherein if the first cache memory does not have sufficient capacity to store~~
25 ~~the acquired data then an amount of data stored in the first cache memory first is transferred to~~
26 ~~the at least one second cache memory by way of the connector unit sufficient to obtain capacity~~
27 ~~in the first cache memory to store the acquired data;~~
28 a transmitter for transmitting the acquired data through the dedicated data transfer
29 path to another channel control unit ~~connected to the channel control unit;~~
30 a receiver for receiving from ~~the other~~said another channel control unit an
31 acknowledgement indicating that the writing of the acquired data to the first cache memory
32 disposed in ~~the other~~said another channel control unit has completed; and
33 a transmitter for transmitting the acquired data to the information processor.

14-16. (Canceled)

1 17. (Currently amended): A computer-readable medium containing a
2 computer program executed on a first channel control unit in a storage control apparatus
3 including a plurality of channel control units each having an interface with the information
4 processor; a disk control unit having an interface with a storage device for storing data; a local
5 cache memory in each channel unit for temporarily storing data to be interchanged between the
6 information processor and the storage device, the local cache memory of at least two of the
7 plurality of channel control units being connected to one another through a dedicated data
8 transfer path used for storing mutually the temporarily stored data; ~~[[and]]~~ a connector unit to
9 provide data paths among the plurality of channel control units and the disk control unit separate
10 from the dedicated data transfer path; and a global cache memory connected to the connector

11 unit, the computer program configured to cause the first channel control unit to perform steps
12 comprising:
13 receiving data to be written from the information processor;
14 writing the data to be written to the local cache memory of the first channel
15 control unit, wherein if the local cache memory does not have sufficient capacity to store the data
16 to be written then first transmitting an amount of data stored in the local cache memory to the
17 global cache memory by way of the connector unit in order to obtain sufficient capacity in the
18 local cache memory to store the data to be written;
19 transmitting the data to be written through the dedicated data transfer path to a
20 second channel control unit connected to the first channel control unit;
21 writing the transmitted data to the local memory of the second channel control
22 unit;
23 receiving from the second channel control unit through the dedicated data transfer
24 path an acknowledgement indicating that the writing of the data to the local cache memory
25 disposed in the second channel control unit has completed; and
26 transmitting the acknowledgement to the information processor.

1 18. (Currently amended): A computer-readable medium containing a
2 computer program executed on a first channel control unit in a storage control apparatus
3 including a plurality of channel control units each having an interface with an information
4 processor; a disk control unit having an interface with a storage device for storing data; a first
5 cache memory in each channel unit for temporarily storing data to be interchanged between the
6 information processor and the storage device, the first cache memory of at least two of the
7 plurality of channel control units being connected to one another through a dedicated data
8 transfer path used; at least two second cache memories; and a connector unit to provide data
9 paths among the plurality of channel control units, the disk control unit and the at least two
10 second cache memories separate from the dedicated data transfer path, the connector unit
11 connected to the second cache memory, the computer program configured to cause the first
12 channel control unit to perform steps comprising:

transmitting to one of the second cache memories a read-out command for data stored therein;

acquiring the data from the one of the second cache memories;

writing the acquired data to the first cache memory of the first channel control unit, wherein if the first cache memory does not have sufficient capacity to store the acquired data then first transmitting an amount of data stored in the first cache memory to the second cache memory by way of the connector unit in order to obtain sufficient capacity in the first cache memory to store the acquired data;

transmitting the acquired data through the dedicated data transfer path to a second channel control unit connected to the first channel control unit; and

receiving from the second channel control unit an acknowledgement indicating that the writing of the acquired data to the first cache memory disposed in the second channel control unit has completed.

19. (Currently amended): A computer-readable medium containing a computer program executed on a first channel control unit in a storage control apparatus including a plurality of channel control units each having an interface with an information processor; a disk control unit having an interface with a storage device for storing data; a first cache memory in each channel unit for temporarily storing data to be interchanged between the information processor and the storage device, the first cache memory of at least two of the plurality of channel control units being connected to one another through a dedicated data transfer path used for storing mutually the temporarily stored data; at least two second cache memories; and a connector unit to provide data paths among the plurality of channel control units, the disk control unit and the second cache memories separate from the dedicated data transfer path, the connector unit connected to the second cache memories, the computer program configured to cause the first channel control unit to perform steps comprising:

receiving from the information processor a read-out command for data for which the address is specified;

15 determining whether the data at the specified address is stored in the first cache
16 memory of the first channel control unit;
17 transmitting a read-out command for the data at the specified address to one of the
18 second cache memories if the data is not stored in the first cache memory;
19 acquiring the data from [[the]]said one of the second cache memories;
20 writing the acquired data to the first cache memory, wherein if the first cache
21 memory does not have sufficient capacity to store the acquired data then first transmitting an
22 amount of data stored in the first cache memory to said one of the second cache memories by
23 way of the connector unit in order to obtain sufficient capacity in the first cache memory to store
24 the acquired data;
25 transmitting the acquired data through the dedicated data transfer path to a second
26 channel control unit connected to the first channel control unit;
27 receiving from the second channel control unit an acknowledgement indicating
28 that the writing of the acquired data to the first cache memory disposed in the second channel
29 control unit has completed; and
30 transmitting the acquired data to the information processor.

20-22. (Canceled)